Remarks

Claims 1-37 were originally pending in this application and claims 38-40 are added by this amendment. The additional limitations of claims 38-40 are clearly described in the specification as originally filed (see, for example, Fig. 4 and paragraph [0034]), and thus no new matter has been added. The fee for consideration of three additional total claims over those already paid for is included herewith. As a result, claims 1-40 are pending and at issue. Of these, claims 1, 16 and 31 are independent claims.

35 U.S.C. § 103 Rejections

Applicants respectfully traverse the rejections of each of claims 1-37 as obvious over Eryurek et al. (U.S. Pat. No. 6,594,603) ("Eryurek") in view of Christensen et. al. (U.S. Pat. No. 6,912,671) ("Christensen"). Reconsideration and withdrawal of the rejections is respectfully requested.

Generally speaking, each of claims 1, 16 and 31 recites a system or a method for use in hazardous area of a process plant which provides protection with respect to faults which occur within a communication bus disposed within the hazardous area and, in particular, to prevent electrical faults within the bus from causing sparks, explosions or other safety problems within the hazardous area of the process plant. By this Amendment, each of the pending claims is amended to clearly recite a method or structure which detects a fault condition within a transmission line or a transmission path of a communication bus having first and second ends to be connected to first and second process devices, and which, in response to the detected fault condition, uses a switching device coupled between the first and second ends of the bus to interrupt the flow of electrical signals along one or both of the first and second transmission paths of the bus and between the first and second ends of the bus. Thus, the claims now clearly recite that the switching device causes the interruption in the transmission path or line of the bus to occur between a first end and a second end of the communication bus.

This method and structure prevents electrical signals from being able to pass through the transmission paths of the communication bus when a fault condition occurs on the bus, thereby preventing unwanted current flow and sparks in or around the bus when the bus has a fault, which might otherwise lead to sparks and explosions within the hazardous area of the process plant. Neither Eryurek nor Christensen

discloses or suggests the use of a switching unit that is coupled between two ends of a communication bus to prevent or interrupt the flow of electrical signals between the two ends of the communication bus in response to a detected fault on the bus.

Simply put, Eryurek fails to disclose a switch or any other device which is coupled to a fault detection unit that detects a fault within a communication bus or which operates to interrupt the flow of electrical signals within a communication bus in response to the detected fault condition, as required by each of the pending claims. In particular, Eryurek discloses a device testing technique that can be used in various types of process control devices (such as sensors, valves, motors, etc.) to detect the improper or degraded operation of the process control device and which operates to alert a maintenance person or other operator of the degraded or faulty condition of the device. More particularly, the Eryurek system performs a resistive measurement within the device being tested and compares the measured resistance to a known or expected resistance value to determine whether the device, e.g., the sensor, is operating properly or up to expectations. While it can be argued that Eryurek generally discloses fault detection circuitry within a process control device, the similarity between the Eryurek system and the recited invention ends there. In particular, Eryurek does not address and does not suggest detecting fault conditions in a communication bus (which is not actually a process control device itself, like a sensor, a valve, a motor, etc.), and thus Eryurek does not address or detect fault conditions in a transmission path associated with a communication bus that transmits signals between different process devices within a process plant, as is recited by the claims at issue. Instead, Eryurek is directed solely to the measurement or detection of faults within actual field devices such as valves, motors, and switches.

Moreover, and importantly, Eryurek does not disclose circuitry of any type that interrupts the transmission of electrical signals on a communication path of a communication bus disposed between different process devices for any reason, much less in response to the detection of a faulty condition within a device. In other words, while the Eryurek system detects the degradation or poor performance of field devices, such as temperature sensors, etc. within a process plant, the Eryurek system merely alerts a user or other maintenance person of the detected fault condition so that person may effect repair or replacement of the faulty device. (See, e.g., Eryurek, col. 6, lines 44-58 and col. 8, lines 57-64.) The Eryurek system does not interrupt the flow of electrical signals anywhere in the system in response to the detection of the fault

condition, much less interrupt the flow of electrical signals within a communication bus in response to the detection of a fault condition. In fact, the Eryurek system does not remove the faulty device from operation within the plant in any manner, which is much different than the recited system and method which actually prevents the operation of the communication bus in response to the detection of a fault condition on the bus.

In summary, Eryurek is directed to the detection of a faulty or suboptimal operating condition within an actual field device (such as a sensor, a motor or a switch), and performs a resistive test merely to alert a user of the suboptimal condition of the device. Eryurek is not concerned with, and does not disclose doing anything with respect to a communication bus, much less interrupting a communication line of a communication bus. Furthermore, even if the Eryurek resistive testing technique could be used in a communication bus, there is no teaching within Eryurek to actually disconnect elements of that communication bus from each other in response to the detection of a fault condition. In fact, the only operation that the Eryurek system takes in response to the detection of a fault (or suboptimal condition), is the notification of such a fault to a user or maintenance person. This operation does not require or use a switch of any kind, much less one that disconnects different parts of a communication bus over which, for example, the fault notification might be sent to the user or maintenance person.

Moreover, and contrary to the examiner's apparent contention, Christensen fails to disclose the use of a switch coupled between first and second ends of a communication bus to disconnect a transmission line of a communication bus ***between the first end and the second end of the communication bus*** or one that switches in any manner in response to a detection of a fault condition within the communication bus. Generally speaking, Christensen discloses a system which may monitor and test the operation of a communication bus 30, such as a HART or a Fieldbus protocol bus, to thereby detect communication failures within the bus 30 and to pinpoint the source of the failure (e.g., to detect a short circuit on the bus, etc.) Importantly, however, Christensen does not disclose or suggest preventing electrical signals from flowing on the bus 30 in response to the detection of a problem on the bus 30 and certainly does not disclose using a switch unit to prevent electrical signals from flowing over the bus 30 between the first and second ends of the bus, as recited by each of the pending claims. In fact, the only act that the Christensen system

performs, in response to the detection of a problem on the bus 30, is to alert or notify a user of the problem so that the user may correct the problem. (See, e.g., Christensen, col. 8, lines 59-63). Christensen fails to provide any reason to modify the Christensen system to disconnect one part of the communication bus 30 from another part of the bus and performs no switching operation in response to a detected fault.

More particularly, while Christensen discloses the use of a "signal switching unit" 150, this switching unit is not part of the communication bus 30 itself, is not disposed between the first and second ends of the bus 30, does not operate in response to the detection of a fault, and does not operate to prevent or interrupt the flow of electrical signals between the first and second ends of the bus 30, as does the switch unit or step recited by the pending claims. In particular, the signal switching unit 150 of Christensen is part of the wiring fault detection unit 128 which is, itself, part of and disposed within the linking device 28. However, the linking device 28 is a process device at which the communication bus 30 terminates. Thus, the signal switching unit 150 is disposed within the device to which an end of the bus 30 is connected, and therefore cannot be disposed in a manner to sever, interrupt or prevent electrical signals from flowing between the first and second ends of the bus 30, as required by the pending claims.

Moreover, the signal switching unit 150 of Christensen does not operate to prevent signals from flowing within the bus 30 at any time, nor could it. Moreover, the switching unit 150 of Christensen does not operate in response to a detected fault, as required by the pending claims, but instead operates to enable the detection of a fault in the first place. In particular, the purpose of the signal switching unit 150 is to connect the measurement blocks 152 to the bus 30 to enable the measurement blocks 152 to send signals over the bus 30 to thereby detect problems on the bus 30. (See, e.g., Christensen, col. 10, lines 1-8). While, in some cases, the switching unit 150 disconnects the communication stack 104 of the linking device 28 from the bus 30, the switching unit 150 does so in conjunction with connecting the measurement blocks 152 to the bus 30 to enable the measurement blocks 150 to send signals over the bus 30. In no instance does the switching unit 150 ever disconnect the bus 30 from the linking device 28 itself, much less operate to disconnect one part of the bus 30 from another part of the bus 30 to prevent signals from flowing over the bus 30 from one end of the bus 30 (connected to the linking device 28) to another end of the

bus 30 (connected to a different device), as would be required by the pending claims. Moreover, the switching unit 150 always operates to connect structure within the system to ***enable*** the detection of a fault on the bus, but does not operate to disconnect anything in the system in ***response*** to the detection of a fault, as required by the pending claims.

Still further, even if the switching unit 150 of the Christensen system did operate to disconnect the linking device 28 entirely from the bus 30 (which it does not do), the switching unit 150 is still not coupled to a transmission line or path of the bus 30 between first and second ends of the bus 30, as required by the pending claims, and thus would still not operate to interrupt the flow of electrical signals between the first and second ends of the bus, as required by the pending claims. In fact, the switching unit 150 of Christensen never operates, under any circumstances, to disconnect a first end of the bus 30 from a second end of the bus 30, as required by the switch unit or step recited by the pending claims.

Still further, there is no reason to change the Christensen system to cause the switching unit 150 to disconnect the linking device 28 from the bus 30 and there is certainly no reason to have the switching unit 150 prevent electrical signals from flowing in the bus 30, as to do so would completely destroy the purpose of the Christensen system, which requires the ability to send signals over the bus 30 from the linking device 28 to enable the linking device 28 to detect problems on the bus 30. Interrupting the signal flow on the bus 30 would prevent this ability to detect problems on the bus 30, which is the whole point of the Christensen system.

In any event, no combination of Eryurek and Christensen results in the claimed invention, as neither Eryurek nor Christensen discloses or suggests a switching unit that is coupled to a transmission line of a bus between first and second ends of the bus or one which operates to prevent or interrupt the flow of electrical signals between the first and second ends of the bus or one which operates to disconnect an element in the system in response to a detected fault on the bus. Moreover, there is no reason or motivation disclosed either in Eryurek or in Christensen to use such a switching unit in the Christensen or Eryurek system. As a result, none of the pending claims is obvious over the combination of Eryurek and Christensen.

Still further, new claim 38 recites that the bus of claim 1 includes a third transmission path and a fourth transmission path connected in a loop within the

communication bus, wherein the safety device is coupled to each of the third and fourth transmission paths and wherein the control unit includes a signal source to send a generated signal through the third transmission path and receives a received signal on the fourth transmission path to detect a fault condition based on the received signal. Neither Eryurek nor Christensen discloses a system that sends a signal over a set of transmission paths connected in a loop in a bus to detect a problem within the bus or one that then disconnects other transmission paths in the bus based on a detected problem or condition, as recited by this claim.

Likewise, each of claims 39 and 40 particularly recites that the control unit and the switch unit of claim 1 are disposed in an intrinsically safe housing or in an explosion proof housing. Neither Eryurek nor Christensen discloses a system that uses either an explosion proof housing or an intrinsically safe housing to enclose any elements thereof, much less to enclose a control unit that detects a fault on a bus or a switch unit that disconnects one part of a bus from another part of a bus. Moreover, there is no reason to use a loop within the communication bus or an explosion proof housing or an intrinsically safe housing in either of the Eryurek or Christensen systems, as neither of these systems is directed to or concerned with providing safety in a hazardous environment. For these reasons, these claims are patentable over the cited art.

Conclusion

For the reasons provided above, applicants respectfully request reconsideration and allowance of claims 1-40.

This response is being submitted with a petition for a two-month extension of time along with the requisite fees therefor. Although applicants believe that no other fees are due, the Commissioner is hereby authorized to charge any fees or credit any overpayments to Deposit Account No. 13-2855 of Marshall, Gerstein & Borun LLP. In addition, if a petition for a further extension of time under 37 CFR 1.136(a) is necessary to maintain the pendancy of this case and is not otherwise requested in this case, applicants request that the Commissioner consider this paper to be a request for an appropriate extension of time and hereby authorize the Commissioner to charge the fee as set forth in 37 CFR 1.17(a) corresponding to the needed extension of time to Deposit Account No. 13-2855 of Marshall, Gerstein & Borun LLP.

If there are matters that can be discussed by telephone to further the prosecution of this application, applicants respectfully request that the examiner call its attorney at the number listed below.

October 11, 2007

Respectfully submitted,

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